



6PPD-quinone

When the Rubber Meets the Road



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Today's Agenda

- Salmon Mortality & Research
- Pollutant Identification
- What is 6PPD & 6PPD-q
- Ecological Toxicity
- Federal Actions
- State Actions
- Source Control & Treatment
- What You Can Do

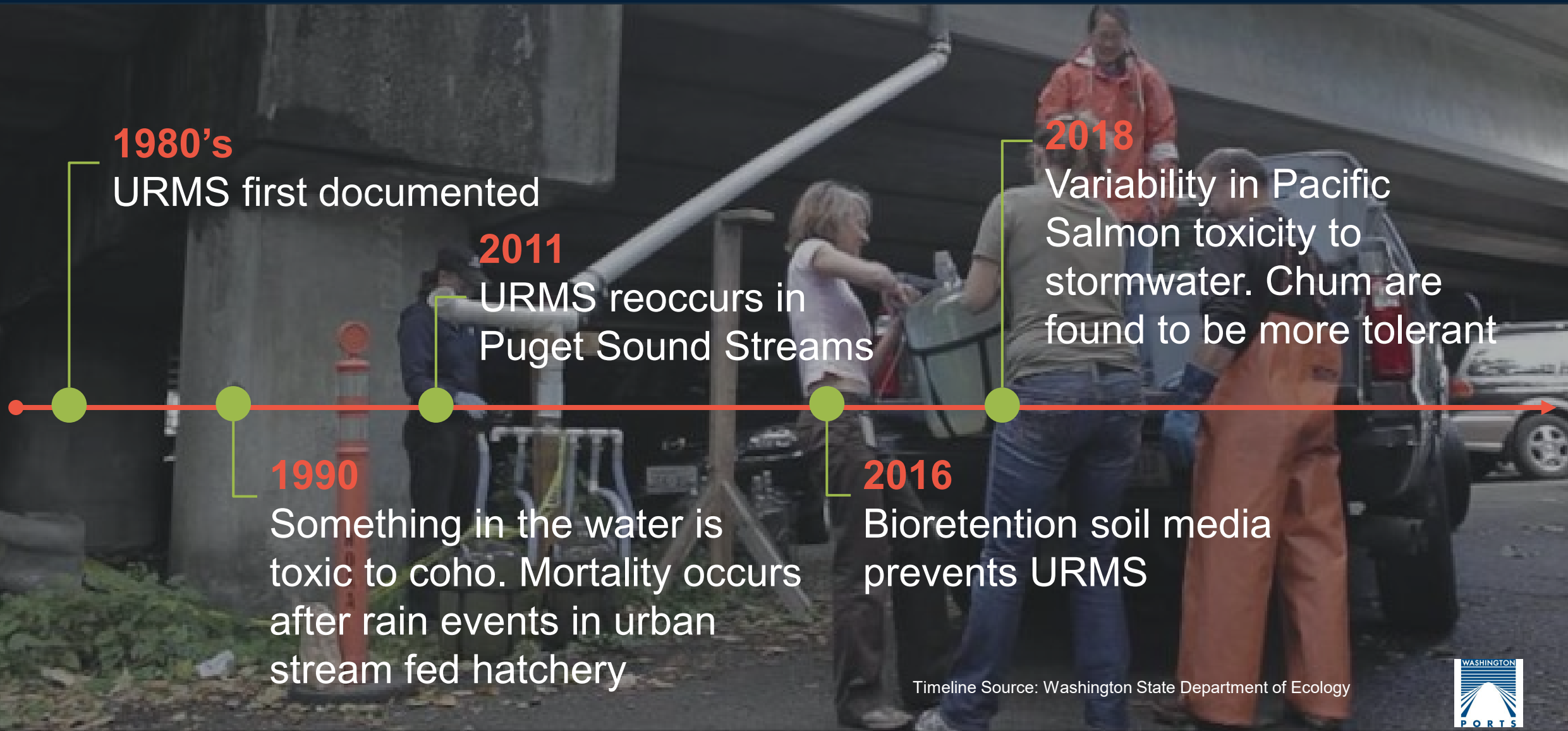


Photo Source: Washington State Department of Ecology
Photo by: Roger Tabor, US Fish and Wildlife

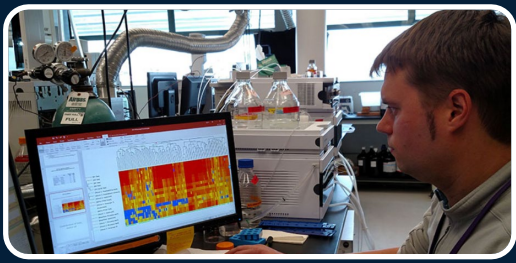


Salmon Mortality & Research

Urban Runoff Mortality Syndrome (URMS) Timeline



Timeline Source: Washington State Department of Ecology



Salmon Mortality & Research

Urban Runoff Mortality Syndrome (URMS) Timeline

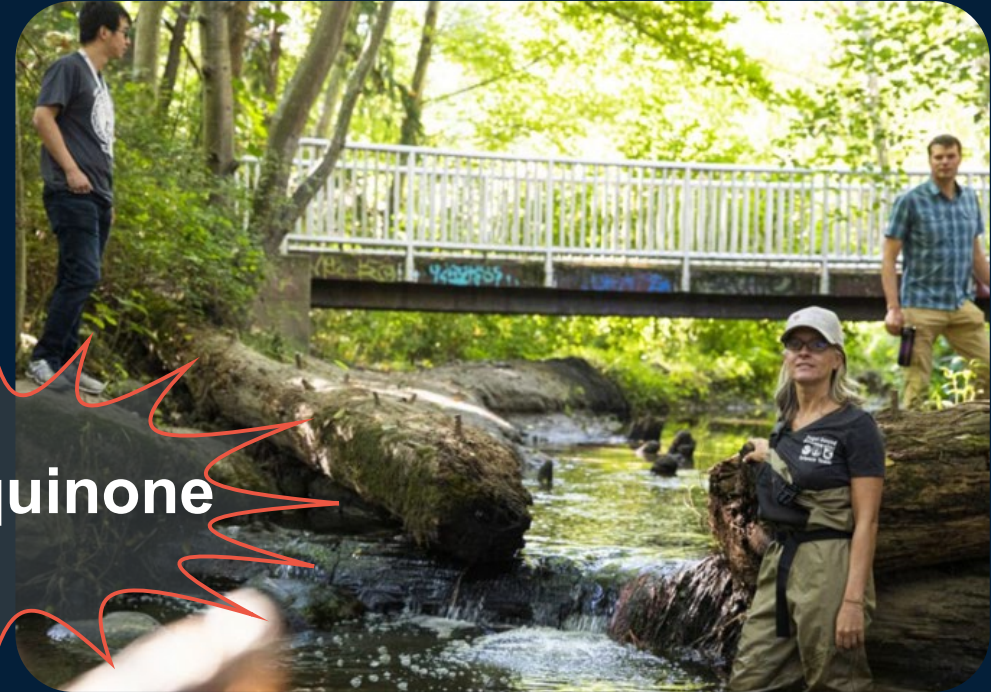
2018

Contaminant research using HRMS started
Advancements allow detection of chemical
cocktail in stormwater

2020

Chemical culprit discovered
among **2,000 chemicals!**

6PPD-quinone



6PPD in Tires

How 6PPD-quinone forms



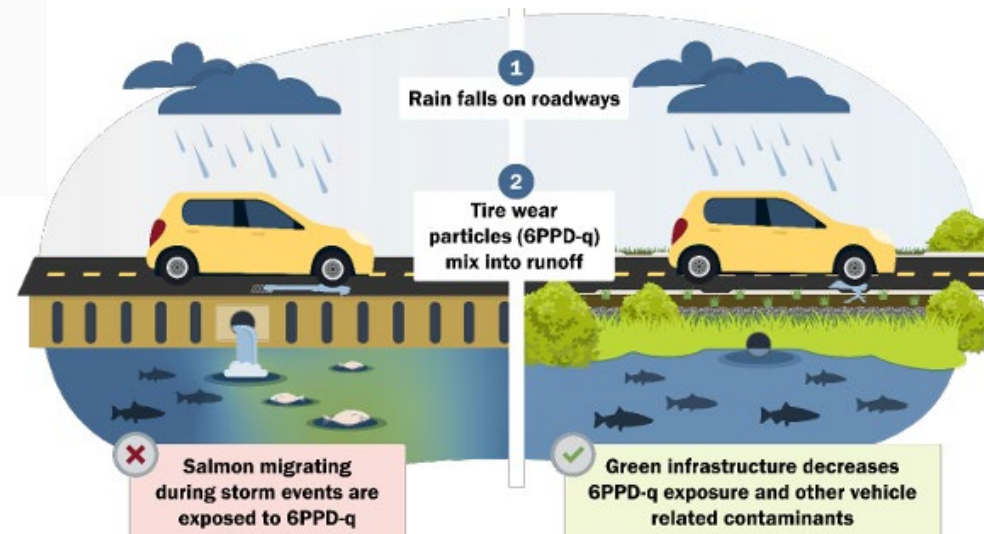
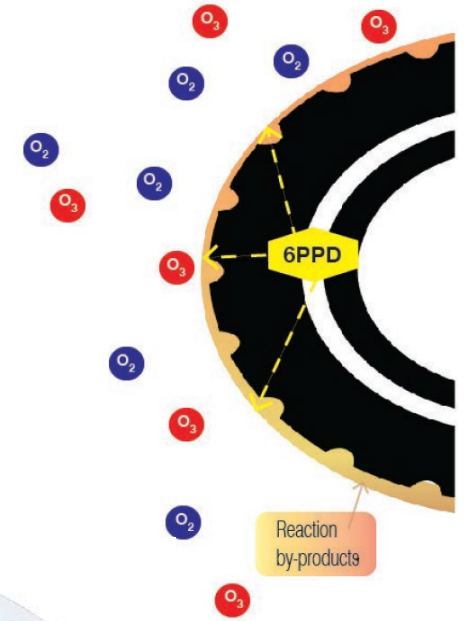
With 6PPD



Without 6PPD



Photo: U.S. Tire Manufacturer's Association



Ecological Toxicology - Washington

Table 1. Reported 6PPD-quinone LC₅₀ concentrations (50% observed mortality) of salmonids.

Species	LC ₅₀ (µg/L)	Test duration (h)	Toxicity Key
Coho salmon (<i>Oncorhynchus kisutch</i>)	0.04, ²⁴ 0.08, ²⁵ 0.095 ²	24	Higher
White-spotted char (<i>Salvelinus leucomaenis pluvius</i>)	0.51 ²⁶	24	
Brook trout (<i>Salvelinus fontinalis</i>)	0.59 ³	24	
Rainbow trout/steelhead (<i>Oncorhynchus mykiss</i>)	0.64, ²⁹ 1.0, ³ 2.26 ⁵	96	
Chinook salmon (<i>Oncorhynchus tshawytscha</i>)	67.3 ²⁴ , 82.1 ²⁵	24	
Sockeye salmon (<i>Oncorhynchus nerka</i>)	Not acutely toxic at 50 ²⁵	24	Lower
Atlantic salmon (<i>Salmo salar</i>)	Not acutely toxic at 12.2 ²⁸	48	
Brown trout (<i>Salmo trutta</i>)	Not acutely toxic at 12.2 ²⁸	48	
Arctic char (<i>Salvelinus alpinus</i>)	Not acutely toxic at 12.7 ³	24	
Southern Dolly Varden (<i>Salvelinus curilus</i>)	Not acutely toxic at 3.8 ²⁶	48	
Cherry salmon (<i>Oncorhynchus masou masou</i>)	Not acutely toxic at 3.5 ²⁶	48	

Table Credit: ITRC 6PPD Focus Sheet, 2023



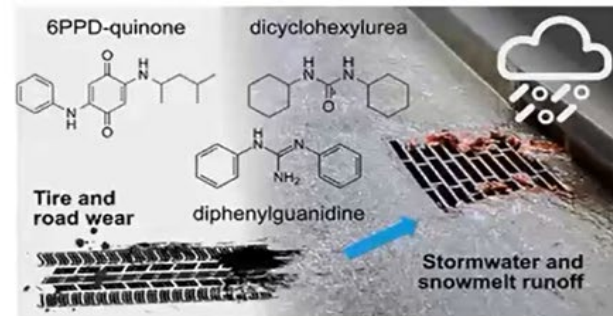
Credit: Governor's Salmon Recovery Office



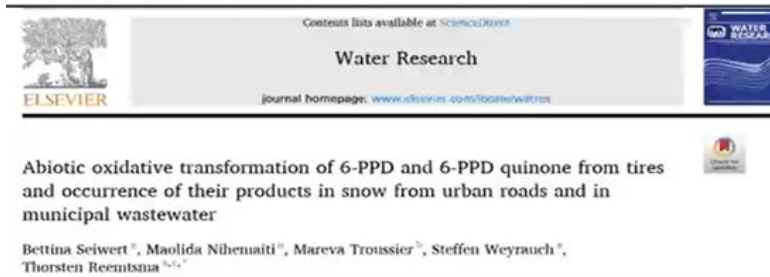
Photo Credit: NOAA Fisheries West Coast Region

Ecological Toxicology Elsewhere

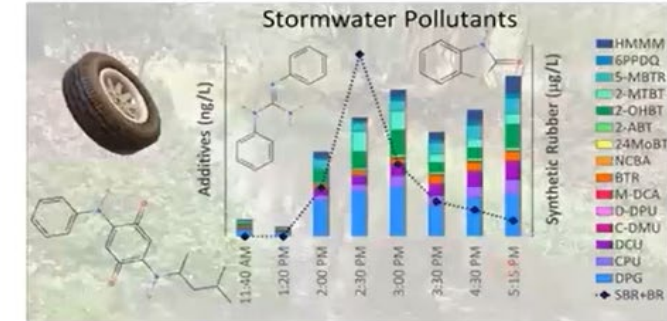
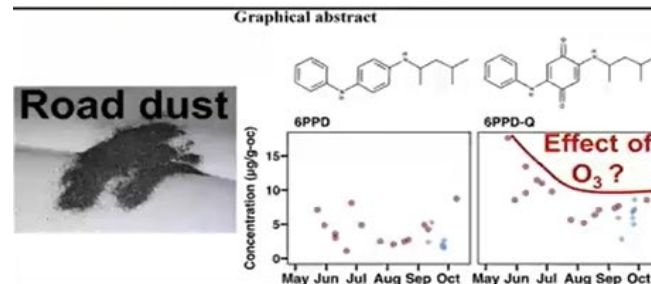
6PPD-Q occurrences: prevalent worldwide



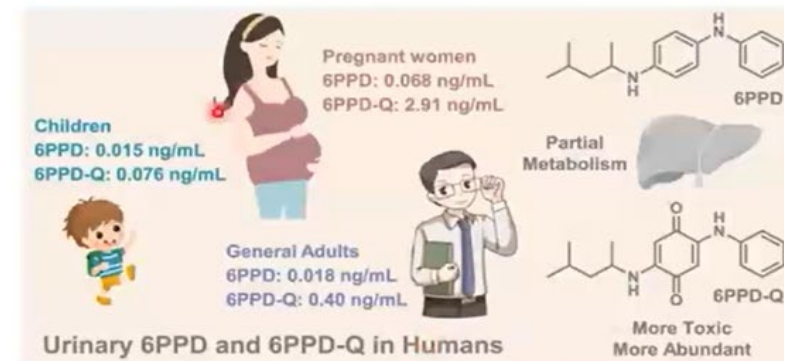
Canada Challis et al., *ES&T Letter* 2021



Germany Seiwert et al., *Water Res.* 2022



Australia Rauert et al., *ES&T* 2022



China Du et al., *ES&T Letter* 2022

Japan Hiki et al., *Environ. Pollut.* 2022

Source: Zhenyu Tian, 2023 Emerging Contaminants in the Environment Conference

State, Federal, & Industry Actions



Listing Motor Vehicle Tires Containing N-(1,3-Dimethylbutyl)-N'-phenyl-p-phenylenediamine (6PPD) as a Priority Product

August 1, 2023

Tribes Petition Environmental Protection Agency to Ban Toxic Chemical from Tires

EPA Grants Tribal Petition to Protect Salmon from Lethal Chemical

November 2, 2023

EPA develops 6PPD-q water testing method for widespread use

“Lightspeed” test development highlights significance of finding salmon-killing tire additive

January 30, 2024

Acute Aquatic Life Screening Value
for 6PPD-quinone
in Freshwater

May 2024

Ecology proposes new and updated limits for toxics in water

USTMA PLEDGES TO WORK WITH EPA ON APPROPRIATE TSCA RISK MANAGEMENT APPROACH FOR 6PPD

LARGEST GLOBAL TIRE INDUSTRY CONSORTIUM RELEASES PRELIMINARY 6PPD ALTERNATIVES ANALYSIS REPORT

Endangered Species Act & Clean Water Act Lawsuits



June 16, 2022

RE: Notice of Intent to Sue For Failure to Comply With Municipal Stormwater General National Pollutant Discharge Elimination Permit, Section S4

U.S. Fishing Groups Sue Tire Manufacturers Over 6PPD Impacts on Salmon, Steelhead

6PPD interacts with ozone to create the highly toxic 6PPD-q

VIA CERTIFIED U.S. MAIL RETURN RECEIPT REQUESTED

Re: Sixty-Day Notice of Violations of the Endangered Species Act for Take of Protected Coho Salmon, Chinook Salmon, and Steelhead Trout



CENTER for BIOLOGICAL DIVERSITY

Saving life on Earth

For Immediate Release, June 15, 2023

Contact: Emily Jeffers, (408) 348-6958, ejeffers@biologicaldiversity.org

Lawsuit Launched Over Failure to Protect Salmon From Toxic Tire Chemical

OAKLAND, Calif.— The Center for Biological Diversity filed a formal [notice](#) today of its intent to sue the Oregon and California state transportation agencies for failing to consider fatal impacts to salmon from toxic tire pollution.

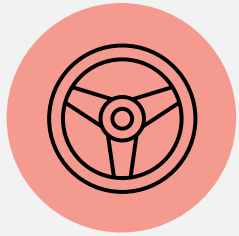
I Might
Be Next!!



Washington State Actions



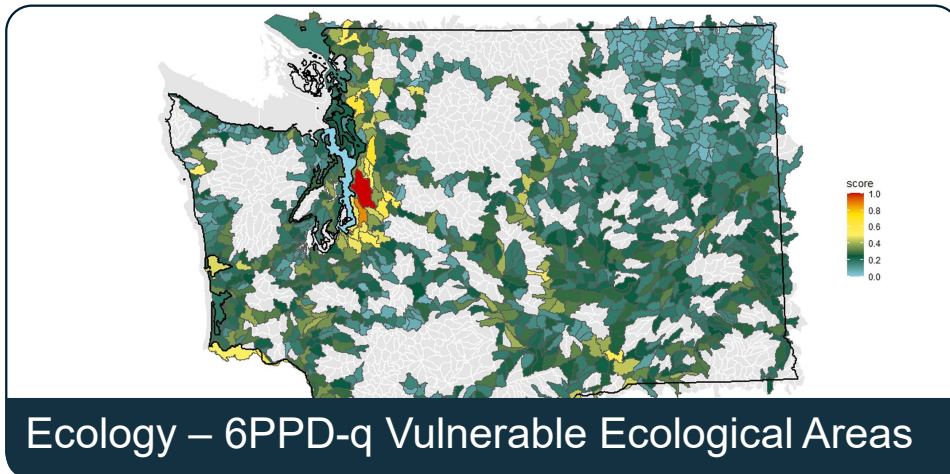
Ecology's 3-Part Approach



Reducing sources of 6PPD & evaluating alternatives

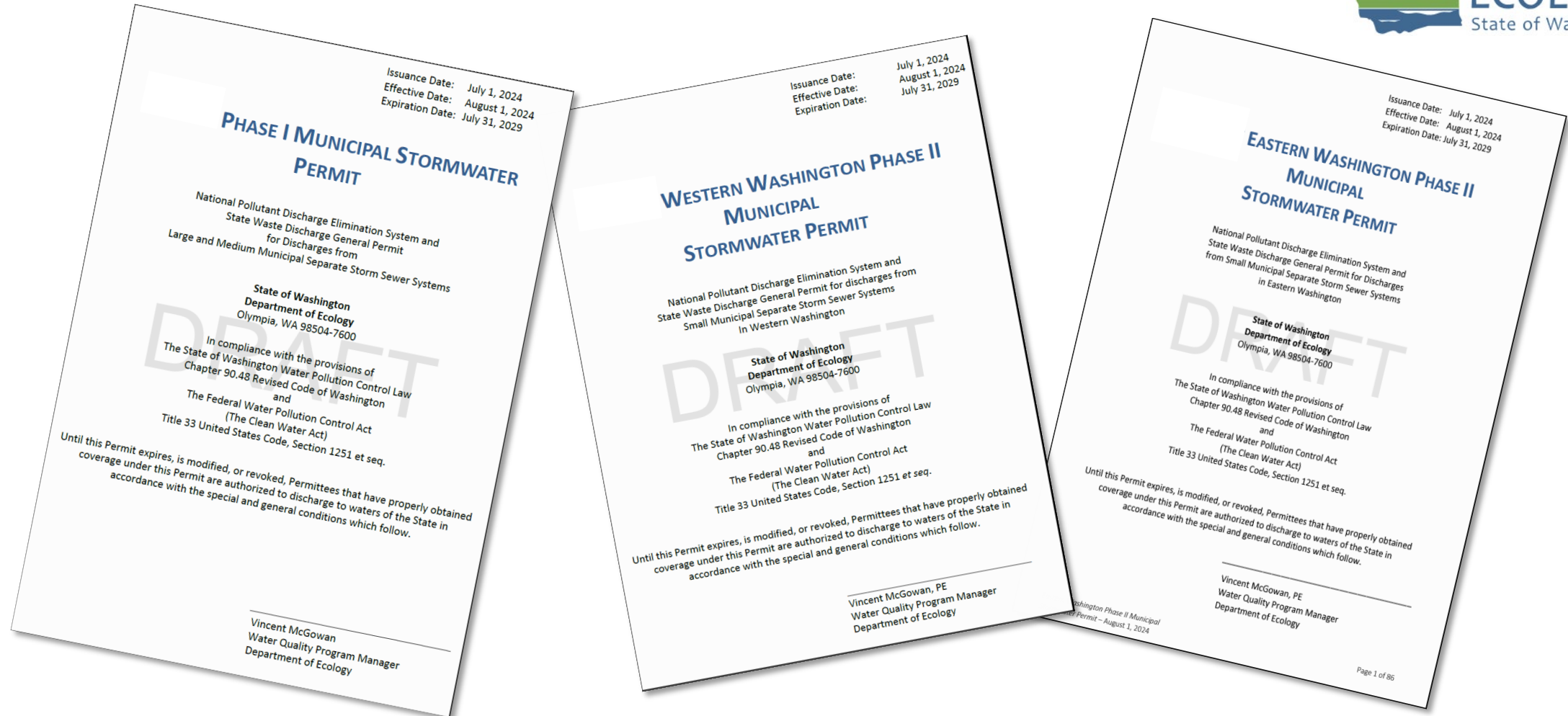
Assessing 6PPD-quinone in the environment

Stormwater Best Management Practices

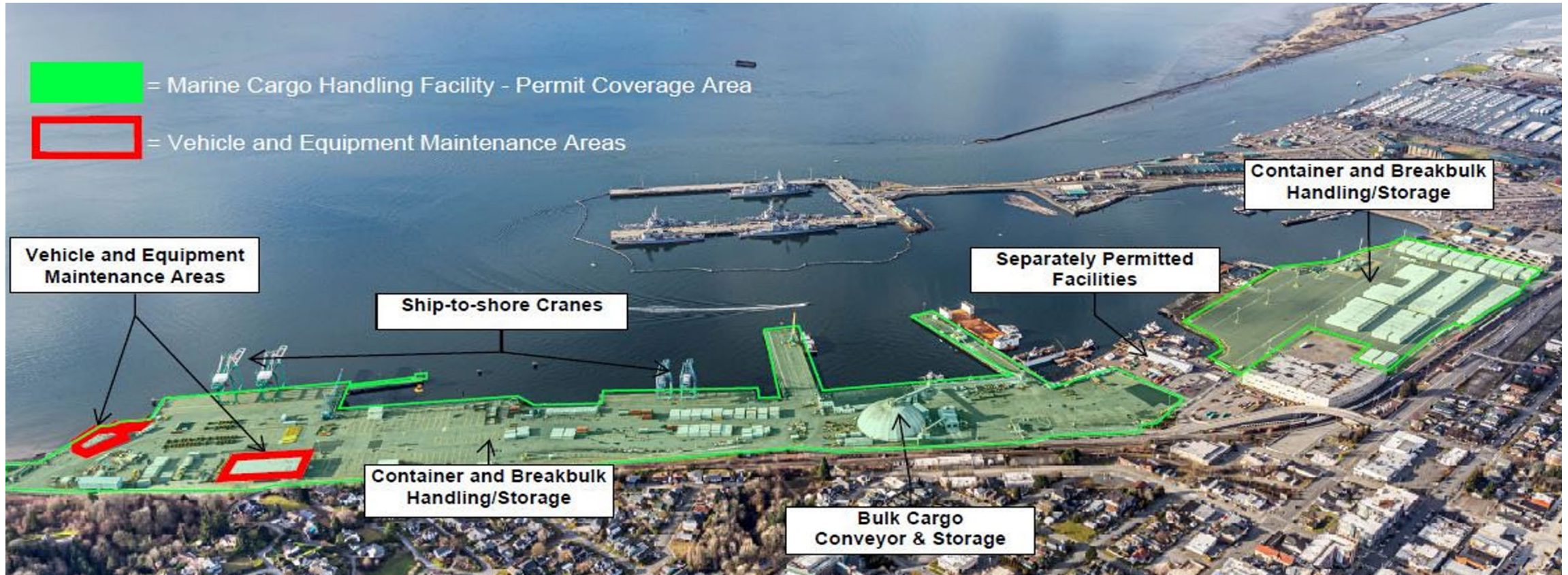


WA State Permitting Actions

Municipal SW Permit Revisions (2024-2029)



Washington – Revised Industrial SW Permit



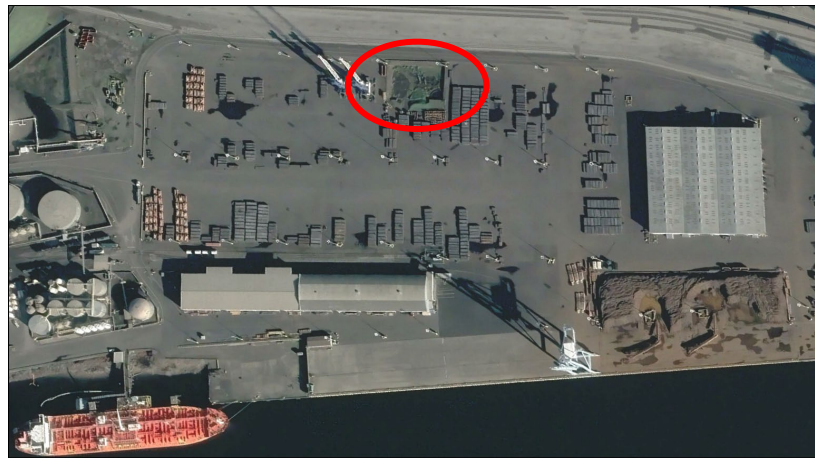
Example of changes in the permitted area for a port. Under the current permit, only areas in red would need coverage. Under the draft permit, both the red and green areas would need coverage. – Photo Created by Washington Department of Ecology

6PPD-q Source Control & Treatment



Regional Facilities

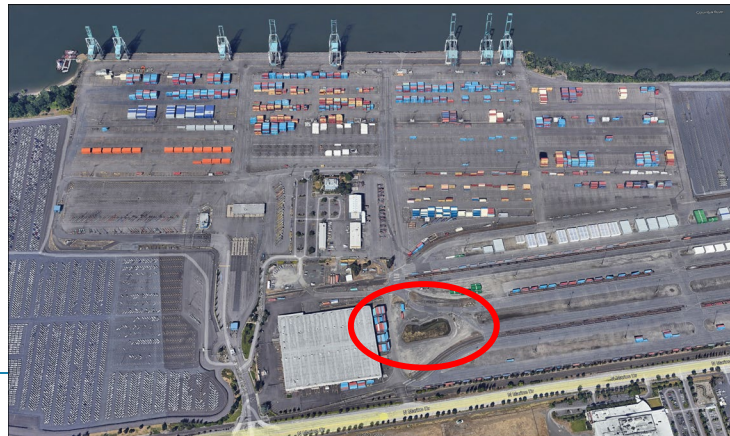
- Several PNW ports are prepared for 6PPD-q
- Applying bioretention soil mix has been proven effective for turbidity, zinc, copper, & TSS
- Tested to be effective for 6PPD-q



Port of Vancouver T2 (2010)



Port of Port Angeles Marine Terminal & CSA (2017)



Port of Portland Terminal 6 (2020)



What You Can Do



Source: Rubber News

Don't let car wash water enter creeks!



Source: Jen McIntyre, Municon 2021

Wash car on lawn or go to a car wash



Drive Less!

Walk, ride a bike,
& telecommute
when possible

Source: Jen McIntyre, Municon 2021

Q&A

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<https://www.youtube.com/watch?v=pZsqLvX5Zol>

Jen McIntyre, Washington State University
WSC Municipal Stormwater Conference 2021

<https://www.youtube.com/watch?v=qpjETu491il>

Zhenyu Tian - Assistant Professor, Northeastern University
2023 Emerging Contaminants in the Environment Conference



Kennedy Jenks